Application no 10/788,923

Claim objection under 37 CFR 1.75(i)

In the Office Action, the Examiner suggested rewriting claims 1-11, 13, 14, 17, and 18 in accordance with 37 CFR 1.75(i). However, in the telephone call with the Examiners on 04/24/2007, this requirement was withdrawn by the Examiners. Applicants have therefore not amended the claims in view of this claim objection.

Claim rejection under 35 USC §102

On the grounds of the following remarks, which also summarize the telephone call with the Examiners on 04/24/2007, applicants respectfully disagree that claims 1-11, 13, 14, 17, and 18 have been anticipated by Kock et al. in WO 03/066289.

Applicants will show that the kinematic structure claimed by applicants is physically, structurally, and kinematically different from figure 11 of WO 03/066289. Moreover, a robot according to applicants' disclosure leads to new, unexpected and more favorable results in terms of robot motion, control and characteristics compared to WO 03/066289.

In the telephone call with the Examiners, applicants put forth three core arguments: The first argument concerns the first (upper) actuator limb of the claimed structure and the upper arm in figure 11 (point 1). The second argument relates to the movable platform and its connections to the forearms or links (point 2). The third argument is in regard to the number of forearms or links supporting the movable platform (point 3).

1. Applicants' claim 1 (p. 34, l. 6-12) describes a structure of the first actuator limb, that is kinematically and physically different from the upper arm in figure 11. The respective paragraph in claim 1 reads (with numerals added to allow for quick identification of the elements in figure 1 of applicants' specification):

"a first actuator limb (A1) comprising at least a platform (11) connected to said base by a revolute joint allowing one rotational degree of freedom about a central axis, a first limb member (13) movably connected to said platform with a single actuated degree of freedom relative to said platform, and a second limb member (15) movably connected to said first limb member [...]"

In other words, claim 1 describes an arm or limb structure that includes *three* movably connected components, i.e. the *platform* (11) that is rotatably connected to the base, the *first limb member* (13) that is movably connected to the platform with a single actuated degree of freedom, and the *second limb member* (15) that is movably connected to the first limb member. Moreover, actuation of this arm structure is achieved by an actuator that is placed between the platform and the first limb member (the "first limb member is movably connected to said platform with a *single actuated*

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degree of freedom relative to said platform"). The revolution joint connecting the platform to the base is free, i.e., unactuated (see p. 16, l. 14 of the specification: "allowing free rotation of platform 11 relative to the base 1").

In contrast, figure 11 shows a kinematically and physically different arm structure. First, it only includes *two* elements, i.e. "a supporting *first arm part* 9 (referred to as B, C by the Examiner) and a *second arm part* comprising a link arrangement 10 (referred to as N by the Examiner) pivotally connected in series via a joint 12" – see, e.g., p. 9, l. 29-30 in the specification of WO 03/066289 which describes figure 1, from which figure 11 is derived ("Figure 11 [...] is a modification of the robot according to Figures 1-4 [...]", p.14, l. 29-30 in WO 03/066289). Second, actuation of this top arm structure is realized differently, namely by actuation means placed between the base (stationary platform) and the supporting first arm part – see, e.g., p. 1, l. 18 "Each first arm part is actuated by a driving means preferably arranged on the stationary element" or p. 6, l. 11, "Each first arm part is arranged connected to the stationary platform and is actuated by a separate actuating means."

Applicants respectfully note that the comparison drawn in the Office Action on p. 4, l. 7-8 "a first limb member (see figure 11, below C) movably connected to said platform with a single actuated degree of freedom relative to said platform" is not correct, because *element C is integral with platform B*. Element B in figure 11 was defined by the Examiner on p. 4, l. 4 as the platform. Thus, element C cannot be "movably connected to said platform (B) with a single actuated degree of freedom relative to said platform".

The Examiner divides the angled arm in figure 11 into two elements B and C. However, WO 03/066289 never discloses the angled arm as being composed of two elements which are movably connected. Neither does it disclose B and C to be movably connected with a single *actuated* degree of freedom", i.e. movably connected by an actuator. The arm is only referred to by a single numeral, i.e. numeral 9 in Fig. 1 in WO 03/066289, from which Fig. 11 is derived. As will be clear to those skilled in the art, the physical shape of the angled arm is not relevant to the functioning of the mechanism in figure 11. The arm could be curved without a sharp bend or any other physical shape determined, e.g., by design concerns.

With respect to Fig. 1 in WO 03/066289, the specification reads: "The first arm 3 comprises a supporting first arm part 9 and a second arm part comprising a link arrangement 10 pivotally connected in series via a joint. The supporting first arm part 9 is rotationally attached to the column 6 through connecting means 11." The supporting first arm part 9 is therefore not composed of two movably connected elements B and C. To those skilled in the art, it would be apparent that a robot mechanism, in which the angle arm in figure 11 was divided into two movably connected elements B and C, would collapse or be uncontrollable and therefore useless or unintentional.

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2. Applicants' claim 1 (p. 34, l. 20 - p. 35, l. 4) describes a movable platform (end component) that is supported by links or forearms in a kinematically and structurally different fashion than shown in figure 11 of WO 03/066289.

According to applicants' claim 1, the movable platform or end component is supported by two joint bodies, each of which are carried by two sets of forearms or links. This is described in claim 1: "said end component movably connected to each of said first and second joint bodies, the end component having at least two rotational degrees of freedom relative to each of said first and second joint bodies [...]" (p. 35, l. 1-3). Moreover, the first joint body is connected to the second limb member of the first actuator limb A1 (top arm) and the forearms of the second and third actuator limbs A2 and A3: "a first joint body, wherein said second limb member is rotatably connected to said first joint body [...], and wherein each of the forearms of said second and third actuator limbs is rotatably connected to said first joint body [...]" (p. 34, l. 20-24). And the second joint body is connected to the forearms of the fourth and fifth actuator limb A4 and A5: "a second joint body, wherein each of the forearms of said fourth and fifth actuator limbs is rotatably connected to said second joint body [...]" (p. 34, l. 26-27).

The described 2-stage structure (end component – two joint bodies – five forearms, incl. the second limb member of the first actuator limb) is kinematically and structurally different from figure 11 in WO 03/066289. Figure 11 shows a movable platform 7 which is directly and separately connected to the links J, K, I, L, N via ball joints. In addition to the comments made in the telephone call with the Examiners, applicants wish to point out that the claimed 2-stage structure improves the mechanism's precision and reduces its cost. Between the forearms and the end component, applicants' structure requires 9 simple joints, i.e., 9 degrees of freedom (5 DOF connecting the forearms to the joint bodies, 2x 2 DOF connecting the joint bodies to the end component, see also FIG. 1 in applicants' disclosure). In contrast, figure 11 employs the equivalent of 10 or 15 simple joints, i.e., 5x 2 DOF if equipped with universal joints or 5x 3 DOF if equipped with ball joints. Each additional joint-DOF generally causes backlash and additional cost, which is both undesired.

In this context, applicants respectfully note that the comparison in the Office Action on p. 5, l. 6 "a first joint body (see figure 11 below, upper portion of 7) [...]" and on p. 5, l. 13 "a second joint body (see figure 11 below, lower portion of 7), [...]" is not correct, because the upper and the lower portion of 7 are *integral, rigidly connected* portions whereas the first joint body and the second joint body are separate elements which are *independently movably connected* to the end component.

Figure 11 of WO 03/066289 as well as figures 1-4, from which the robot in figure 11 is derived, show a movable platform 7 as a single rigid element. Even though the movable platform may comprise several "crank parts" (see p. 13, l. 11-12 in WO 03/066289) or portions as defined by the Examiner, they are rigidly connected. If they were not, it would be apparent to those skilled in the art that the robot in figure 11 would collapse and be useless or unintended.

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The first and second joint body, in contrast, are separate elements which are movably connected. Applicants' claim 1 reads "[...] said end component *movably connected to each of* said first and second joint body, the end component having at least two rotational degrees of freedom relative to *each of* said first and second joint body [...]" (p. 35, l. 1-3). Because the end component is movably connected to *each of* the joint bodies, the joint bodies are also movably connected to each other via the end component. This is further supported by the disclosed figures (e.g., FIG. 1, joint bodies 20 and 30). Applicants' first and second joint body therefore do not compare to the upper and lower portion of 7 in figure 11.

3. Applicants' claim 1 (p. 34, l. 16) describes a kinematic structure, in which only five forearms or links are required to support the movable platform, whereas in figure 11 of WO 03/066289 six links are necessary.

Figure 11 shows in total six links which support the movable platform 7, i.e. links J, K (which includes 2 links), N, I, and L. These six links are required because, in general, an object like the movable platform has six degrees of freedom in space and each of the links constrains the movable platform in only one degree of freedom. This is further supported by the specification of WO 03/066289 on p. 14, l. 29, which refers to the robot in figure 11 as a "combination 2/1/1/1/1". The nomenclature "2/1/1/1/1" describes the arrangement of in total six links supporting the movable platform in space (see p. 2, l. 19-26). To someone skilled in the art, it would be apparent that with less than six links, the movable platform 7 would be uncontrollable in space and the robot would hence collapse. Such a configuration would not be intended.

In contrast, the kinematic structure disclosed by applicants only requires in total five links or forearms to support the end component (via the joint bodies). This is apparent from FIGS. 1, 3, 7, 8, 9, 10, 14, 15. In FIG. 1, for example, the five forearms are the second limb member 15 of the first actuator limb A1 and the four forearms 5 of the second, third, fourth, and fifth actuator limb A2-5. This is further supported by claim 1 which recites a first forearm ("a second limb member" on p. 34, l. 9) and four further forearms ("[...] each of said second, third, fourth, and fifth actuator limbs further comprising *a forearm* movably connected to said actuator arm of the respective actuator limb [...]" (p. 34, l. 15-17). Please note that the first forearm ("second limb member") has just been named differently due to the different kinematic structure of actuator limb A1 vs. actuator limbs A2-5.

Please note that the use of fewer links or forearms in applicants' kinematic structure is possible, because the first actuator limb A1 constrains two degrees of freedom of the end component. The robot must therefore be considered structurally more efficient.

In the telephone call, the Examiners pointed out that currently claim 1 reads "comprising [...] a second limb member" (p. 34, l. 9) and "comprising a forearm"

(p. 34, l. 16), which allows for further forearms or links. Therefore, as discussed during the telephone call, applicants wish to amend claim 1 and replace "a forearm" with "one and only one forearm" and, respectively, "a second limb member" with "one and only one second limb member" in order to explicitly limit the number of forearms. This amendment has also been shown in section "Amendments" of this response, and has been repeated at the end, highlighting the deletions/additions (section "Highlighted claim amendments").

In addition to the above-mentioned three core arguments put forth in the phone call, applicants would like to comment on the comparison drawn by the Examiner in the Office Action. These comments were included in the material that applicants faxed to the Examiners prior to the telephone call, but were not discussed in the call.

a) Applicants' claim limitation on p. 5, l. 6-12 of the Office Action "a first joint body (see figure 11 below, upper portion of 7), wherein the second limb member is rotatably connected to said first joint body and allowed to rotate relative to said first joint body about a first joint axis [...]" (claim 1) is not met by figure 11 or WO 03/066289. Claim 1 specifies a rotatable connection (a revolute joint) with a single degree of freedom whereas figure 11 shows a pivotable connection (a ball joint) with at least two degrees of freedom.

   Claim 1 in applicants' disclosure specifies that the second limb member as well as the forearms of each of said second and third actuator limbs are "rotatably connected" to the first joint body and "allowed to rotate" relative to the first joint body "about a first joint axis". This is further supported by the specification, which specifies a revolute joint for the connection between the first joint body and the second limb member (p. 17, l. 26-29) and the forearms of the second and third actuator limbs (p. 18, l. 2-4). To those skilled in the art, a rotatable connection (resp. a revolute joint) is known to allow rotational motion with a single degree of freedom.

   However, figure 11 of WO 03/066289 shows ball joints for the connections between element 7 and the links I, K, N. This is confirmed by the Examiner on p. 8, l. 16-17 in the Office Action and further supported by the specification of WO 03/066289 on p. 10, l. 1-2 (describing figure 1 from which figure 11 is derived): "The link arrangement 10 is *pivotally* connected to the movable platform 7 via a joint 13." (see also p. 10, l. 7-8 and p. 10, l. 13-14). To those skilled in the art, a pivotable connection is known to have at least two rotational degrees of freedom. This is confirmed in WO 03/066289 on p. 11, l. 28 - p. 12, l. 1: "The joints 13, 21, 22, 32, 33 and 34 are designed to allow a relative movement of *two or three degrees of freedom* between the link arrangement 10, 15, 24 and the movable platform 7, respectively. In reality, the individual joints 13, 21, 22, 32, 33 and 34 comprise universal joints or ball joints."

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Therefore, the upper portion of 7 in figure 11 does not compare to the first joint body in applicants' disclosure, because the connection between the upper portion of 7 and the links does not compare to the connection between the first joint body and the second limb member. The same is true for the connection between the first joint body and the forearms of the second and third actuator limb. Therefore, the limitation of claim 1 is not met by figure 11.

b) Applicants' claim limitation on p. 5, l. 13-17 of the Office Action "a second joint body (see figure 11 below, lower portion of 7), [...]" (claim 1) is not met by figure 11 or WO 03/066289 for the same reason as illustrated above in a). Claim 1 specifies a rotatable connection (a revolute joint) with a single degree of freedom whereas figure 11 shows a pivotable connection (a ball joint) with at least two degrees of freedom.

Therefore, the lower portion of 7 in figure 11 does not compare to the second joint body in applicants' disclosure, because the connection between the lower portion of 7 and the links does not compare to the connection between the second joint body and the forearms of the fourth and fifth actuator limb. The limitation of claim 1 is not met by figure 11.

c) Applicants' claim limitation on p. 6, l. 1-5 of the Office Action "said end component (7a) movably connected to each of said first and second joint bodies, the end component having at least two rotational degrees of freedom relative to each of said first and second joint body [...]" (claim 1) is not met by figure 11 or WO 03/066289 because in WO 03/066289 the object 7a is *fixedly carried* by the movable platform 7 while in applicants' disclosure the end component is *movably connected* to the joint bodies (which are compared to the upper and lower portion of platform 7 by the Examiner).

WO 03/066289 specifies "The arms 3, 4, 5 are connecting a stationary column 6a and a movable platform 7 in the combination 3/2/1 for carrying an object 7a (figure 2) to be manipulated." Figure 2 illustrates how object 7a (e.g., a gripper or a tool turner) is carried by the movable platform, i.e., it is fixedly attached. To those skilled in the art, it will be apparent that the attachment must be fixed because otherwise, the object 7a would be uncontrollable and hence the robot useless.

Therefore, object 7a in WO 03/066289 does not compare to the end component in applicants' disclosure. The limitation of claim 1 is not met by figure 11.

d) Applicants' claim limitation on p. 7, l. 9-16 of the Office Action "wherein said first limb member is connected to said platform by an actuated revolute joint [...]" (claim 9) is not met by figure 11 or WO 03/066289 for several reasons:

The claim specifies an actuated revolute joint connecting the first limb member to the platform. The Examiner defined the first limb member as C (p. 4, l. 7) and the platform as B (p. 4, l. 4). Neither does figure 11 show an actuated

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revolute joint between the angled arm parts B and C, nor does WO 03/066289 mention that the angle arm is composed of two portions B and C movably connected by and actuated revolute joint. WO 03/066289 always refers to the arm as one integral element – see remarks under point 1. Moreover, on p. 6, l. 11, WO 03/066289 reads: "Each first arm part is arranged connected to the stationary platform and is actuated by a separate actuating means." Therefore, the actuation of the robot is achieved by actuation means located between the column (stationary platform, M) and the first arm parts (B, E-H) rather than between B and C.

The claim further specifies a *revolute joint* connecting the first limb member to the second limb member which the Examiner defined as N (p. 4, l. 9). A revolute joint allows one rotational degree of freedom.. However, figure 11 shows a ball joint between C and N which allows three rotational degrees of freedom. This is further supported by the specification of WO 03/066289 on p. 11, l. 17-23: "The joints 12, 16, 17, 25, 26 and 27 are designed to allow a relative movement of three degrees of freedom between respective supporting arm parts 9, 14 and 23 and link arrangements 10, 15 and 24. Two of the said three degrees of freedom consist of pivoting in all directions about two real or imaginary axes placed at an angle to each other and the third is in the form of rotation of an individual link about its longitudinal axis. In reality, the individual joints 12, 16, 17, 26 and 27 comprise ball joints or universal joints."

Therefore, the limitation of applicants' claim 9 is not met by figure 11 or, more generally, WO 03/066289.

e) Applicants' claim limitation on p. 8, l. 1-7 of the Office Action "wherein said end component is connected to said first joint body by a first and a second revolute joint in series [...]" (claim 10) is not met by figure 11 or WO 03/066289 because the upper and lower portion of 7 in figure 11 (which the Examiner compares to the joint bodies) *fixedly* carry the object 7a (which the Examiner compares to the end component) whereas the connection between the end component and the joint bodies is *movable*, or more specifically, made up of two revolute joints in series - see also remarks under c).

Moreover, the Examiner's statement on p. 8, l. 1-14 of the Office Action does not seem consistent with Examiner's preceding definitions. The limitations of applicants' claims 10 and 11 refer to the movable connection between the end component and the joint bodies. The Examiner previously defined the end component as 7a (p. 6, l. 1) and the joint bodies as the upper and lower portion of 7 (p. 5, l. 6 and l. 13). However, on p. 9, l. 1-7 the Examiner compares the movable connection to the ball joints between links I-L, N and 7 rather than the connection between 7 and 7a. Neither figure 11 nor WO 03/066289 disclose ball joints between 7 and 7a. To those skilled in the art, such a connection would make the object 7a uncontrollable and the robot useless.

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Henceforth, the limitation of applicants' claims 10 and 11 are not met by figure 11 or, more generally, WO 03/066289.

f) Applicants' claim limitation on p. 9, l. 5-11 of the Office Action "wherein said second limb member is connected to said first joint body by a revolute joint [...]"(claim 18) is not met by figure 11 or WO 03/066289 because applicants' claim specifies *revolute joints* for the connections between the joint bodies and the second limb member, resp. the forearm of the actuator limbs. Revolute joints allow rotary motion with *one degree of freedom*.

Figure 11 shows joints with *at least two rotational degrees of freedom*, e.g., ball joints for the connection between I-L, N and 7. This is further supported by WO 03/066289 on p. 11, l. 28 - p. 12, l. 1: "The joints 13, 21, 22, 32, 33 and 34 are designed to allow a relative movement of two or three degrees of freedom between the link arrangement 10, 15, 24 and the movable platform 7, respectively. In reality, the individual joints 13, 21, 22, 32, 33 and 34 comprise universal joints or ball joints." To those skilled in the art, it will be apparent that a robot according to figure 11 would not work if revolute joints were installed and hence be useless.

Therefore, the limitation of applicants' claim 18 is not met by figure 11 or, more generally, WO 03/066289.

The above remarks show that the claimed structure is kinematically and physically different from figure 11 in WO 03/066289. In the following, applicants would like to additionally point out that a robot built in according with the specification shows new, unexpected and much more favorable results in terms of robot motion, control and characteristics compared to WO 03/066289 (the comments were also included in the material sent prior to the telephone call, but were not discussed). Some of the important results are, for example:

¶ The robot mechanism according to applicants' disclosure has a closed-form solution of the forward kinematics equations (see p. 9, l. 5-19; p. 3, l. 17-29), which greatly reduces the complexity of the controls allowing use of standard controls hardware, regular skilled personnel and "faster processing by the computer" (see p. 22, l. 19-31). As will be apparent to those skilled in the art, the robot shown in figure 11 of WO 03/066289 does not allow for a closed form solution of the forward kinematics (compare p. 3, l. 17-29 in applicants' disclosure). Prior art devices such as the one shown in figure 11 require highly specialized experts working over considerable time to implement robot controls.

¶ In a robot mechanism according to applicants' disclosure, the end component's vertical motion is primarily influenced by the (upper) first actuator limb A1. To achieve a vertical motion, the upper end of the first limb member 13 of the actuator limb A1 generally moves vertically "up and down" via a rotation about

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axis 12a (see FIG. 1). Therefore, there is a close directional relationship between the two motions which leads to homogeneous stiffness and accuracy characteristics in the vertical direction. In contrast, the end of arm (B, C) of the robot in figure 11 of WO 03/066289 moves in a horizontal plane (also shown by the dotted lines in figure 1 of WO 03/066289). There is an unfavorable relationship between the motion of the end of arm (B, C) and the movable platform 7: When the movable platform 7 is up, a small rotation of arm (B, C) leads to a large vertical displacement of 7. When the movable platform 7 is down, arm (B, C) has to rotate by a large angle to vertically displace 7. Therefore, the robot in figure 11 has inhomogeneous stiffness, speed, acceleration and accuracy characteristics in the vertical direction, which is clearly undesirable in industrial applications.

¶ The robot mechanism according to applicants' disclosure has "symmetric workspace conditions and a favorable structural stiffness" because the first actuator limb A1 is forced to remain midway between the second and third actuator limbs A2, A3 (see p. 10, l. 17-21). In contrast, figure 11 of WO 03/066289 has an asymmetric arm arrangement, where the first arm (B, C) is placed either clockwise or counterclockwise from the movable platform. This leads to undesirable asymmetric stiffness and accuracy conditions in the workspace, particularly in the horizontal directions (compare p. 6, l. 14-17 in applicants' disclosure).

¶ The robot mechanism according to applicants' disclosure has "symmetric orientation capability throughout the workspace" due to the symmetric arm arrangement and the bi-tetrahedral structure (see p. 10, l. 9-10). In other words, the tilting capability of the end component is the same. In contrast, the robot in figure 11 of WO 03/066289 has an asymmetric arm arrangement, i.e. the upper arm (B,C, N) is located either clockwise or counterclockwise from the movable platform and there are two links K vs. one opposing link L. This leads to asymmetric tilting capabilities of the moving platform 7. An asymmetric tilting capability is clearly less desirable in general industrial applications.

¶ In a robot mechanism according to applicants' disclosure, the end component 40 is always oriented tangentially relative to a circle about the vertical axis 1a, regardless of the position of the end component. This constant orientation is the result of the symmetric arm arrangement. The constant orientation has great practical advantages, i.e. for picking up tools which are located radially from the robot. In contrast, the orientation of the movable platform 7 of figure 11 of WO 03/066289 changes significantly depending on the radial position of the robot. This is because the orientation of the movable platform 7 (about an axis parallel to A) is determined by the orientation of arm G, which forces the same orientation onto 7 via the parallel link arrangement K.

¶ Position and orientation of the movable platform of the robot in figure 11 are highly coupled which complicates the controls of the mechanism (similar to

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Stewart-Gough robots, see p. 3, l. 30 – p. 4, l. 10 in applicants' specification). Applicants' robot has decoupled position and orientation (p. 11, l. 1-3). Moreover, depending on the geometry, the workspace of the robot in figure 11 can be limited due to singularities inside the reachable space of the robot (singularities are positions in which the movable platform gains an uncontrollable degree of freedom). A robot according to applicants' disclosure has a bi-tetrahedral design, in which singularities only occur at the outer bounds of the reachable space.

¶ As described in applicants' specification on p. 6, l. 27-31, the use of ball-and-socket joints as shown in figure 11 may not be desirable in many applications, e.g., those with high accuracy requirements. Applicants' robot is designed such that it can be equipped with more precise, cost efficient revolute joints and a minimum number of such revolute joints (see p. 9, l. 25-27).

On the grounds of the preceding arguments, applicants respectfully disagree that the prior art made of record can be considered pertinent to applicants' disclosure. Applicants' claim limitations describe a robot that is kinematically, physically and structurally different from the robot shown in figure 11 of WO 03/066289 and henceforth novel. Moreover, a robot according to applicants' claims has new, unexpected and more favorable results desired by the automation and robotics industry.

Request for examination of claims 1-11, 13, 14, 17, 18 and 12, 15, 16, 19-24

In view of the remarks and amendments, applicants respectfully request reexamination and reconsideration of claims 1-11, 13, 14, 17, and 18. Applicants believe that with the amended claim 1, the application now has an allowable generic claim. The previous Office Action dated 01/19/2007 points out on p. 3 that "upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim". Therefore, applicants also respectfully request consideration and examination of claims 12, 15, 16, and 19-24 because these claims depend from claim 1 and require all the limitations of claim 1, as shown subsequently:

Claim 12 specifies the movable connection between the forearms and actuator arms of the second, third, fourth, and fifth actuator limb to be composed of three revolute joints, as shown in FIG. 4. Claim 1 is generic to this subject matter because it reads "wherein the forearm has at least three degrees of freedom relative to the actuator arm" (p. 34, l. 17-18). Since a revolute joint allows one rotational degree of freedom, three revolute joints allow "at least three degrees of freedom".

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Claim 15 specifies a further actuator mounted to the base to drive a work tool, as shown in FIGS. 7 and 8. Similarly, claim 16 specifies a further actuator mounted to the end component to drive a work tool, as shown in FIG. 6. Claim 1 is generic to both cases because it reads "A mechanism for positioning and orienting an end component in space with at least five degrees of freedom, the mechanism comprising". Therefore, the mechanism may comprise an additional actuator and work tool.

Claims 19-24 specify additional influencing means urging the platform of the first actuator limb to be rotated about the central axis, as shown in FIGS. 9, 10, and 14. Claim 1 is generic to them because it reads "A mechanism for positioning and orienting an end component in space with at least five degrees of freedom, the mechanism comprising". Therefore, the mechanism may comprise additional influencing means.

Conclusion

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would help or expedite the prosecution of the subject application, the Examiner is invited to contact the applicants via email or phone.

Respectfully submitted,

Michael Lot

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